

SUBJECT: ELECTRICAL ENGINEERING : PAPER – I

Time: 3 hours

Full Marks: 200

Note: Answer Question No. 1 and any four from the rest. All questions carry equal marks.**1. Answer any 10 (ten):** 10 x 4 = 40

- (a) Define unit step and unit impulse forcing functions.
- (b) Current flowing in a series circuit having four equal resistances is I amperes. What is the magnitude of the current if the four resistances are connected in parallel?
- (c) Explain why moving iron instruments can be used to measure both A.C. and D.C.
- (d) Two resistors of 4Ω and 12Ω are connected in parallel and the combination is connected in series with a 2Ω resistor. If this circuit is connected across a 100 V supply, find the total current drawn.
- (e) Two capacitors of capacitance $32\ \mu\text{F}$ each are connected in parallel with a third capacitor of capacitance $64\ \mu\text{F}$ in series. Find the resultant capacitance.
- (f) Explain the diffusion and drift currents in a semiconductor.
- (g) What is the role of doping of impurities in pure silicon or germanium?
- (h) Establish the relation between Z and Y parameters of a two-port network.
- (i) What are active and passive transducers? Give examples of each type.
- (j) What VTVM stands for? What are the various types of VTVM used in practice?
- (k) A capacitor of $40\ \mu\text{F}$ is charged to a potential difference of 500 V. Find the energy stored in the electric field between the plates of this capacitor.
- (l) Two sinusoidal currents are given by $i_1 = 10 \sin(\omega t + \pi/3)$ and $i_2 = 15 \sin(\omega t - \pi/4)$. What is the phase difference between them?

2. Attempt any 8 (eight): 8 x 5 = 40

- (a) State Norton's theorem, and then write down the steps necessary to nortonize a given circuit.
- (b) State and prove maximum power transfer theorem.
- (c) What is an LVDT? With the help of a neat sketch, explain its working principle.
- (d) What is Hall Effect? "Hall co-efficient of a p-type semiconductor is positive"-what is the significance of the statement?
- (e) What is meant by superconductivity? How is it affected by the application of a magnetic field?
- (f) What is a spectrum analyzer? Draw its simplified block diagram.
- (g) What do you understand by 'resonance in an A.C. circuit'? Distinguish between resonance in series circuit and resonance in parallel circuit.
- (h) What is a 'Q-meter'? Explain its working principle.
- (i) Draw the block diagram of a general telemetering system, and state the function of each block.
- (j) Explain the 'Piezoelectric effect' observed in crystals, and state its applications.

